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UNITED STATES DEPARTMENT OF AGRICULTURE

BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE

FOREST INSECT INVESTIGATIONS

FOREST INSECT SURVEY OF THE INYO NATIONAL FOREST

Season of 1938

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by
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Berkeley, California
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INYO NATIONAL FOREST.

Season of 1938

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FOREST INSECT SURVEY OF THE INYO NATIONAL FOREST

Season of 1938.

A complete forest insect survey was made of the Inyo National Forest, exclusive of the White Mountains district, by the Bureau of Entomology and Plant Quarantine during September 1938. The entomological results of this survey are set forth in the following report. That section dealing with the infestations in Jeffrey pine, and the plot examinations, has been compiled by S. T. Carlson, who carried out these surveys. The section devoted to general reconnaissance, special studies and examination of recreational areas is the work of J. E. Patterson who had the advice and assistance of Assistant Supervisor H. H. Simpson on a part of the field work.

Infestation conditions in general are very favorable throughout the Jeffrey pine forests, with recent annual losses around normal status. Losses in these stands are due almost entirely to the Jeffrey pine beetle, Dendroctonus jeffreyi. Initial attacks by this species are confined to the mid-bole and basal section of the stem. Other species, such as the engraver beetles, Ips emarginatus, Ips confusus, and flathead borers, Melanophila sp., are associated insects, filling in green sections of the mid-bole and tops of trees attacked by the Jeffrey pine beetle.

A decade and a half ago witnessed the greatest windfall known in the history of this forest. The wind thrown trees, which in some areas amounted to fully 50% of the mature stand, provided ideal breeding material for the several species of tree killing insects indigenous to those forests. Epidemic conditions prevailed for a period of years as a result of this slash impetus. The successive annual infestations accumulated a final insect loss of approximately 20% during the years 1925 to 1935. However, epidemic conditions have greatly subsided and a normal status has again been established.

Conditions in the lodgepole pine forests are satisfactory with the exception of a local infestation at Twin Lakes in the Mammoth region. This local infestation is treated separately in this report. Other areas suffering former losses, Glass Creek and Deadman's Creek, are now free of the mountain pine beetle, which previous to 1935 had been active, taking a rather heavy toll of mature trees.

At the present time the fir stands are suffering the greatest injury from active, and recent infestations. Active infestations of the fir engraver beetles, Scolytus ventralis and Scolytus subscaber, are causing extensive damage to tops and limbs of both red fir and white fir. Damage by these insects usually results in the death of the affected part of the tree; normally 10 to 20 feet of the top. Attacked white fir often put out secondary terminals and may survive as stag tops for many years. Such

recovery has not been noted in cases of top killed red fir. Secondary attacks by the round headed borer, Tetropium abietis, are widespread throughout the fir stands and it is this beetle that is responsible for the high mortality of mature trees. It is not often primary in its attacks, but is able to develop sudden epidemic infestations in fire weakened trees and in stands infested by other insects. An epidemic of this character has developed in the Mammoth Lakes region in white fir stands defoliated by the tussock moth and is killing a high percent of these weakened trees. A 100% cruise of the tussock moth defoliated area at Hess Mill Hill showed that 20% of the stripped trees had been attacked by Tetropium during the past two years. It is estimated that fully 10% of the fir throughout the Mammoth region has died during the past 5 years from the combined attacks of Scolytus and Tetropium.

Special Studies.

Infestations of Oslar's tussock moth, Hemerocampa oslari, in white fir; the lodgepole pine needleminer, Recurvaria milleri, in lodgepole pine and pinon pine; and the Great Basin tent caterpillar, Malacosoma fragilis, attacking bitter brush, have become sufficiently important to warrant special study. These have been given attention in connection with the annual surveys, and by independent examination during the past two years. Separate reports dealing with these species are planned, but a review of those infestations is included here.

Oslar's Tussock Moth.

In the past, this defoliator has shown very definite infestation cycles; the periodicity of epidemics ranging between 20 and 30 years. A recent epidemic developed in many widely separated places throughout the white fir stands on the eastern slopes of the Sierras. Infestations on the Inyo occurred at Convict Peaks, in the Mammoth region, on the headwaters of Glass and Deadman's Creeks, and near Big Spring. Examinations of the oldest defoliated areas indicate that the epidemic began in 1934. During the following 3 years the epidemic continued unabated and resulted in near complete defoliation of trees in the centers of greatest intensity. Many trees died outright as a result of defoliation while many more were sufficiently weakened to induce attacks by Scolytus and Tetropium, causing high mortality in these defoliated stands. This epidemic was short lived and subsided suddenly in the fall of 1937. Very few caterpillars hatched in the spring of 1938, and the result of feeding during the past season was scarcely noticeable. No evidence of current activity could be found in September. It is now evident that the epidemic has run its course. The full effects of the defoliations during the 4 year period of the epidemic's existance are not yet possible of determination since secondary infestations by other insects have not run their complete course. However, the net results to date may be summed up by analysis of data secured on a sample plot studied in the Hess Mill Hill area. These analyses show that: of the total number of white fir trees examined 89% were attacked; 55% were partially defoliated; and 33% were completely defoliated. Trees in the latter class are highly attractive to Tetropium and 20% have already died from its

attacks. Present plans provide for a continuation of these studies until final results are obtainable.

Lodgepole Pine Needleminer.

Evidence of past activity of this needleminer is available in the defoliated lodgepole pine stands on the south flank of Cowtrack Mountain in Twp. 1 N, R 28 and 29 E. Since this epidemic has long since disappeared, it was possible only to secure data on subsequent effects. These consisted in the larger measure of a high percent of kill by the mountain pine beetle which followed the needleminer, although it too has now disappeared. Assistant Supervisor Simpson states that this needleminer outbreak occurred about 1918 and was highly epidemic for a period of 10 years. Present evidence shows that it covered an area of about 10,000 acres. Defoliation is still visible in the form of skeletonized crowns, and dead limbs and terminals. Many small trees were killed outright. These still endure as bleached snags. The mountain pine beetle infestation that developed afterward was of only moderate intensity and was largely confined to the pumice ridges and upper slopes. It disappeared in 1934. A comparison of beetle killed and surviving trees shows that the loss was not over 10% of the stand.

The only current needleminer infestation is located in Twp. 4 S, R 30 E, and occupies the basin lying between Round Mountain, Chicago Canyon and Casa Diablo Mountain; an area of about 7,000 acres. Infestation is confined to pinon pine, Pinus monophylla. The species has been tentatively described as Recurvaria milleri, but appears to be a paler and larger race than typical specimens of milleri. Its life history has not been worked out. The infestation is highly epidemic and very aggressive, showing a spread of about 2 miles each flight period. Assistant Supervisor Simpson states that it first appeared on the east slope of Casa Diablo Mountain in 1928. It has been present since that time, gradually spreading north and west over the pinon forested plateau, and leaving a ghost forest in its wake. The original infested area is now a dead forest and that portion included in the recent spread is being rapidly devastated. Flight of the adults occurs in July, so at the time the area was examined in September the brood consisted of young caterpillars in needles of the 1938 growth. The needles mined by caterpillars of previous generations had largely fallen and formed a dense carpet under the trees. Needle count of heavily infested trees showed that about 90% of all growth prior to 1938 had been mined and had fallen. Infested trees had an extremely ratty appearance with many dead laterals and terminals. All trees within the confines of the infestation have been attacked, and all show damage ranging in severity from dead twigs to death of the entire tree. There is ample evidence that continued infestation over a period of 4 to 5 years results in the death of the affected tree. There is no other insect involved in this infestation so there is little doubt of the lethal character of this species in its attacks on pinon. Further study of this infestation is planned. Sprays are being tested for control of needleminer infestations in lodgepole pine. If effective, they would also be applicable to identical infestations in pinon pine.

General view of defoliated lodgepole pine on a pumice ridge where infestation was heaviest. Dead trees show activity of the mountain pine beetle which followed the needleminer, killing many defoliated trees.

Close up of a defoliated stand showing trees killed by the mountain pine beetle. Approximately 10% of the defoliated trees later succumbed to attacks of this beetle.

An example of lodgepole pine which was defoliated by the needleminer over 10 years ago. The crown symmetry was destroyed and many laterals killed. These trees have not yet fully recovered from the effects of defoliation.

General view of the needleminer defoliated area of pinon near Casa Diablo Mountain. This view shows a section of the forest which has recently been invaded by the needleminer; the infestation covers an area of 7,000 acres.

Many trees have died as a direct result of defoliation. These trees cannot survive repeated defoliations. A ghost forest results from infestations continued for 5 to 10 years.

Infested trees have a ratty appearance with sparse foliage and dead laterals and terminals. Continued damage results in their death.

Repeated defoliations have taken 90% of the needles of this tree. The mined needles fall soon after flight of the moths, exposing the bare limbs and twigs.

Great Basin Tent Caterpillar.

The recent epidemic of the great basin tent caterpillar which appeared in sections of the Long Valley range has entirely subsided without causing great damage to its host, bitter brush, Purshia tridentata. Former outbreaks of this insect have resulted in the death of the bitter brush over large areas, greatly impairing the range for a period of years. The subsidence of the recent outbreak in its early stage was fortunate since no practical means of control is known for open range infestations.

Mountain pine Beetle in Lodgepole Pine.

A localized infestation of the mountain pine beetle, Dendroctonus monticolae, has persisted for the past four years in the lodgepole pine stands bordering Twin Lakes and Mary's Lake. This infestation is not epidemic and is largely confined to the margin of the lakes where about 140 trees are being killed each year. This infestation originated a few years ago when the level of the lakes was raised, flooding the riparian stands which were soon invaded by the beetle. The infestation has long since left these riparian stands, which have been largely killed out, and is now localized in the reaches just back of them, although it has not diminished in volume or intensity. It is believed that the infestation will continue unless checked by control work. The current infestation amounts to 157 attacked trees. It is expected that about the same number of trees will be infested next spring, and it is strongly recommended that these trees be felled and treated at that time. The control method recommended for this infestation is burning the infested trees. Due to the high elevation of the area and late spring conditions, emergence is delayed so that control work may be done any time during the period May 1 to June 30. It is suggested that this work be done by CCC labor from the nearby Mammoth camp. The crews should have competent supervision by a forest officer familiar with insect control.

A thorough cleanup of all infested lodgepole pine is urgently recommended. Any aggressive broods left will be able to reinfest the area and greatly nullify the results.

Mountain pine beetle infestation in the riparian stands of lodgepole pine at Twin Lakes. The two large trees in left foreground were killed in 1938.

A group of infested lodgepole pine at the north end of the lake. There are 27 infested trees in this group.

Jeffrey Pine Losses.

Current losses of Jeffrey pine in the vicinity of Mammoth Lakes are about normal. The losses are principally due to attacks from the Jeffrey pine beetle, Dendroctonus jeffreyi. The 1937 loss per section is 12 trees with a volume of 24,000 board feet. The 1938 loss so far is slightly greater, being 14 trees with a volume of 36,000 board feet. Losses are generally confined to large mature trees.

Losses in the region north of Mammoth Lakes, near Mono Craters is relatively low.

A tabulation of losses over the period 1936-37 with partial 1938 losses is shown in Table I.

SUMMARY

A forest insect survey of the Inyo National Forest was made in September, 1938, by the Bureau of Entomology and Plant Quarantine. Two phases of investigative work were carried on, one dealing with barkbeetle infestations and the other with defoliators.

Barkbeetle examinations were carried out in the Jeffrey pine, white fir and lodgepole pine stands. Present infestations of these stands are slightly above previous losses, with the greatest loss occurring in the lodgepole pine type around Twin and Mary's Lakes. White fir losses from the fir engraver beetles and the round headed fir borer are occurring in areas that have been invaded by the fir tussock moth.

A special study was made of the fir tussock moth, lodgepole pine needleminer and the Great Basin Tent Caterpillar. The Tussock Moth has recently been very active in the white fir belt on this forest. Defoliation when severe, has resulted in death of many trees; in other instances the trees were so weakened that attacks of the fir engraver beetles and round heads were induced. A study plot was set out in the white fir type. There was no evidence at this time of the tussock moth and it is evident that this outbreak which started in 1934 has died out.

A needleminer has been and is very active in the stands of pinon pine in T 4 S, R 30 E, on an area of about 7,000 acres. This infestation now in its epidemic stage has resulted in the killing of pinon pine on an area of 2,000 acres.

The recent epidemic of the Great Basin Tent Caterpillar has died out, as no traces of it were found.

Table I. Plot Losses - Inyo National Forest

Plot	Timbered acreage	Tree species	1936			1937			1938 (Part.)		
			No. trees	Vol.	BM/acre	No. trees	Vol.	BM/acre	No. trees	Vol.	BM/Acre
Mammoth	430	Jeffrey pine	8	22,010	51	12	24,020	56	14	36,310	85
Mono Craters	260	Jeffrey pine	10	7,980	30	16	21,160	81	6	16,120	62

RECOMMENDATIONS

Immediate control of the mountain pine beetle infestation at Twin Lake and Mary's Lake is recommended. This work should be done in May or June 1939. A thorough cleanup is essential to secure lasting control.

Control work in the Jeffrey pine stands is not recommended at the present time, although some areas show a slightly increased infestation since 1937. These areas should be closely watched to detect any further increased losses.

Studies in the Tussock Moth defoliated fir stands should be continued, to secure complete data on the end result of these defoliations.

Study of the life history of the needleminer in pinon pine should be continued. The spread of this species should be closely watched. Methods for its control should be investigated.